

A PHORETIC RELATIONSHIP BETWEEN A CHIRONOMID LARVA AND AN OPERCULATE STREAM SNAIL^{1, 2}

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ABSTRACT: Approximately 8000 *Goniobasis semicarinata* (Say) [Gastropoda:Pleuroceridae] were quantitatively collected from three sampling stations in the Mosquito Creek drainage system, Harrison County, Indiana from summer 1976 through summer 1977. Each of the snails was examined for the presence of sand grain cases inhabited by *Rheotanytarsus* sp. (Diptera: Chironomidae). The percentages of mature snails used as phoretic symbionts by the chironomid larvae were as high as 56% at one sampling station during one summer season and were routinely greater than 35% at two of the three stations during all seasons. In addition, approximately 10% of these snails demonstrated multiple infestations. This is the first record of a chironomid larva using an operculate stream snail as a phoretic symbiont.

Symbiotic relationships between mollusks and insects have been reported occasionally in the literature (Steffan 1967), and those relationships have generally been restricted to pulmonate snails and dipteran larvae. The nature of the relationship between a gill-breathing operculate snail *Goniobasis semicarinata* and a chironomid larva which constructs sand grain cases on the snail's shell in the Mosquito Creek drainage system, Harrison County, Indiana was investigated from summer 1976 through summer 1977.

Snails were collected by Surber sampler using a stratified random transect sampling design at three stations within the 66-km² drainage area. The snails at each station represented a distinct population as defined by Mayr (1969), since they were physically isolated from one another.

The symbiotic relationship was studied on the basis of percentage occurrence within the snail populations. Each snail collected in an individual sample was examined for the presence of sand grain cases occupied by chironomid larvae.

Ninety larvae were randomly collected from snail shells during the sampling period. The head capsule from each larva was mounted in CMCP (Turttox) mounting medium and identified with a compound microscope. Of the 90 larvae obtained from the shells of *G. semicarinata*, 89 were identified as

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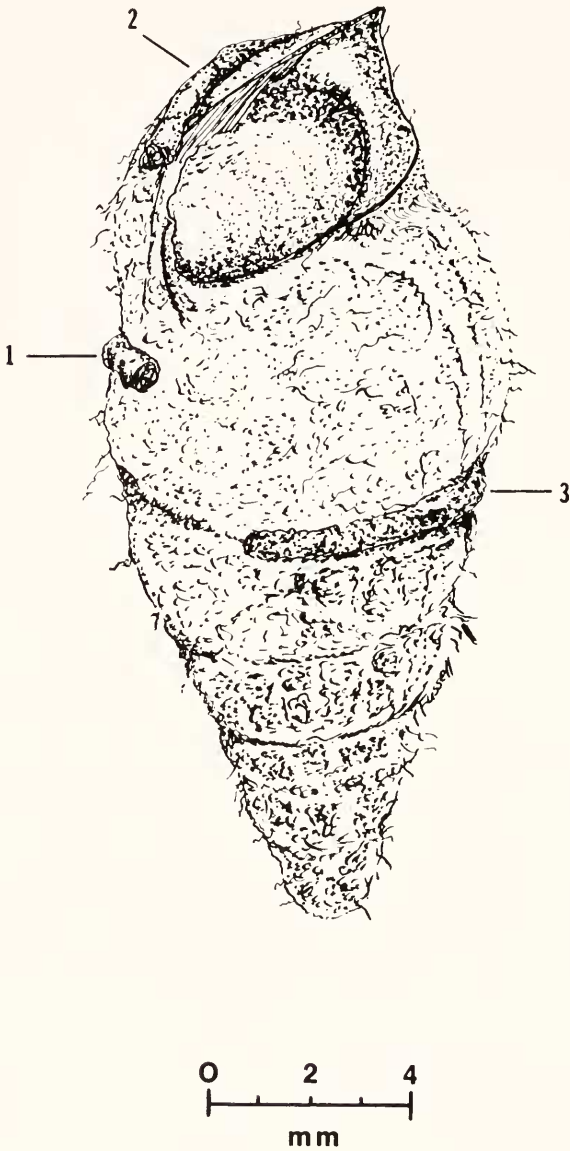


Figure 1. A mature *goniobasis semicarinata* shell with attached *Rheotanytarsus* sp. sand grain cases (from Mancini 1978).

Rheotanytarsus sp. The single exception was an unidentified coleopteran larva which was inhabiting a previously abandoned *Rheotanytarsus* sp. case.

A typical mature snail with three chironomid cases attached to the shell is illustrated in Fig. 1. The locations of the cases are not random, and the numbers 1, 2, and 3 designate the first, second, and third most common case sites occupied on a mature snail shell.

The percentages of live snails used as symbionts by the larvae are presented in Table 1. It should be pointed out that percentages of occurrence were higher for mature (greater than 1.5 years of age) snails than for immature individuals, and that multiple infestations occurred in approximately 10% of the affected snails. Indeed, one snail was found with seven inhabited *Rheotanytarsus* sp. larval cases attached to its shell.

Van Benthem-Jutting (1938) reported that larvae of *Parachironomus varus* lived and fed on *Physa fontinalis* and supported the theory with evidence of mutilated sections of the foot and mantle digitations. In addition, van Benthem-Jutting also found that the larvae had a preferred case-building site on the snail's shell along the parietal wall of the aperture near the free edge of the peristome.

In the Mosquito Creek drainage system the relationship between *G. semicarinata* and *Rheotanytarsus* sp. seems to be phoretic as I have found no

Table 1. Percentages of live, mature, and young-of-the-year (Y-O-Y) *G. semicarinata* used as phoretic symbionts by *Rheotanytarsus* sp. in the Mosquito Creek drainage, summer 1976 through summer 1977.

Population and Age Group	SEASON		
	Summer 1976	Winter 1976-1977	Summer 1977
A Mature	42.0	54.4	37.0
1975 Y-O-Y	33.3	50.0	—
1976 Y-O-Y	3.9	12.6	24.4
1977 Y-O-Y	—	—	3.8
B Mature	0	10.4	8.4
1975 Y-O-Y	12.5	0	—
1976 Y-O-Y	0.6	1.7	12.3
1977 Y-O-Y	—	—	0
C Mature	56.3	39.3	50.6
1975 Y-O-Y	47.6	—	—
1976 Y-O-Y	9.1	2.4	90.0
1977 Y-O-Y	—	—	0

evidence to suggest that the fly larva feeds on the snail. Such a relationship has not been reported previously for any aquatic operculate snail with any other insect larva or for this chironomid genus and any other snail.

Roback (1977) in reporting a phoretic relationship between a large hemipteran, *Cryphocricos peruvianus*, and a chironomid larva *Eukiefferiella* sp. suggested that these relationships may be relatively common in nature. These data from the Mosquito Creek drainage system do, indeed, demonstrate this relationship to be common, at least on a local level.

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